injecting the load into a reactor, wherein the reactor is operated at a second temperature, wherein the second temperature is less than about 520° C and about 20° C-25° C greater than the first temperature;

01

mechanically shearing the molecules of the load with a jet to produce hydrocarbons comprising liquid hydrocarbons, substantially no gaseous hydrocarbons, and substantially no coke or soot

30. **(amended)** The process of claim 29, wherein the temperature of the reactor is about 540° C.

02

31. **(amended)** The process of claim 29, wherein the temperature of the jet is about 25° C greater than the temperature of the reactor.

41. **(amended)** The system of claim 38, wherein the second temperature is about 540° C.

03

42. **(amended)** The system of claim 38, wherein the third temperature is about 25° C greater than the second temperature.

REMARKS

The Applicant appreciates the time taken by the Examiner to review the present application. This application has been carefully reviewed in light of the Office Action mailed December 5, 2001. The Applicant respectfully requests reconsideration and favorable action in this case.

SUMMARY

Claims 1 and 21-42 are pending in the application. Claims 21, 30 and 31 are objected to because of an informality. Claims 21-25 were withdrawn from consideration by the Examiner. Claims 1, 21-23 and 26-31 stand rejected under 35 U.S.C. § 103.

Applicants appreciate the time taken by the Examiner to review Applicants' present application. This application has been carefully reviewed in light of the Official Action mailed

December 5, 2001. Applicants respectfully request reconsideration and favorable action in this case. Claims 1, 30, 31, 41 and 42 have been amended.

ELECTION/RESTRICTION

The Examiner states that newly submitted Claims 32-42 are directed to an invention that is independent or distinct from the invention originally claimed. The only reason presented by the Examiner to support the election/restriction requirement is that "Claims 32-42 are directed to an apparatus, wherein the previously elected invention is drawn to a process." The Applicant respectfully submits that the claimed process and apparatus are not independent and distinct and that the Examiner has not shown that they are independent and distinct. Accordingly, the Applicant requests that the election/restriction requirement be withdrawn.

CLAIM OBJECTIONS

The examiner objects to claims 21, 30 and 31 because the claimed temperatures do not include the degree symbol. The Applicant understands this objection to relate to claims 1, 30, 31, 41 and 42. The Applicant has amended these claims to include the degree symbol and accordingly believes the Examiner's objection has been overcome.

REJECTIONS UNDER SECTION §103

Claims 1, 21-23 and 26-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the oral translation of German Patent No. 1,049,851 in view of "Modern Petroleum Technology" and U.S. Patent No. 4,426,278 issued to Koppers. The Applicant respectfully traverses this rejection.

The applicant first notes that the Examiner's arguments are directed to a number of limitations which do not appear in the claims. For example, the Examiner states that "the reference's vaporization of a gas/feed mixture is considered to correspond to Applicant's expanding of a load at a second pressure..." It therefore appears that the Examiner has not considered the currently pending claims, but has simply recycled a previous office action which addresses a previous set of claims. The applicant respectfully requests that the Examiner withdraw the office action. Despite the inapplicability of some of the Examiner's arguments to

the present claims, the applicant will nevertheless address the Examiner's arguments to point out the patentability of the claims.

The Examiner states that German patent 1,049,851 ("Koppers") "discloses a process for the production of light hydrocarbons by thermal cracking" (emphasis added). The Examiner further states that "[t]he reference's heat transfer gas is considered to correspond to applicant's jet containing energy" (emphasis added). The Examiner specifically notes that "the reference is silent about the jet mechanically shearing the molecules of the load," but states that the high-speed introduction of gas through the nozzle inlet of Koppers "would accomplish the same mechanical shearing claimed by applicants." The applicant respectfully disagrees.

Koppers explicitly teaches away from the mechanical shearing of the molecules of the load by describing a process which employs thermal cracking rather than mechanical shearing (page 1, line 5; page 3, lines 13-16; page 4, line 11). Koppers further states that cracking of the load requires that "the molecules must be exposed to correspondingly brief periods of high temperatures" and that "the [bigger] the oil drops are, the longer the time required by the content [ ] to absorb the required energy for cracking" (page 3, lines 13-18). It is therefore clear that Koppers teaches thermal cracking and not mechanical shearing of the molecules of the load.

This is further supported by Koppers' description of the "high-speed" gas. Where Koppers sets forth the specific functions performed by the heat transfer gas, mechanical shearing is not mentioned or implied (see page 2, line 18 - page 3, line 5). Koppers further states that the cracking reaction "takes place in the co-current flow of the heat transfer medium and the starting material" (page 2, lines 1-2). Still further, Koppers states that the heat transfer medium "pulls the liquid [load] as a result of the injection effect from one or a plurality of inlet conduits" (page 2, lines 10-11; see also page 5, lines 10-11, which describes the inlet as a Laval nozzle). Koppers therefore clearly teaches that the heat transfer gas and described in the reference is injected in the reactor to create a co-current flow with the load so that it can transfer thermal energy to the load and thereby crack it. There is no suggestion whatsoever that Koppers' heat transfer gas produces any mechanical shearing of the molecules of the load. In fact, this reference teaches away from such shearing by teaching that the reactor is configured to form a co-current flow of the load and the heat transfer gas.

For the foregoing reasons, the Koppers reference fails to teach or suggest that mechanical shearing limitations of the claims.

The Examiner also states that "the reference's disclosure of a high boiling point crude fraction meets Applicant's heavy distillate / residue limitation. The applicant respectfully disagrees. It is well-known in the art of the invention that high boiling point crudes (such as the napthane-based crude disclosed at page 6 of the reference) are distinct from heavy distillates and residues recited in the claims. The reference therefore fails to meet this limitation as well.

The Examiner also states that, while Koppers is silent about a reactor temperature of less than about 520 degrees C, the "modern petroleum technology" reference illustrates that conventional thermal cracking of crude is accomplished at about 455-540 degrees C. The applicant respectfully disagrees. The Examiner cites page 280, lines 20-21 for support, but the Applicant points out that this passage also states that heavy residual tars are rejected. The reference's disclosure is directed to reduced crudes. Clearly, then, a person of ordinary skill in the art would not have taken this disclosure to mean that heavy distillates or residues can be converted using the disclosed method.

As to the Kosters reference, the Examiner states that the preheating temperatures are low enough to prevent significant cracking. The Examiner fails to note, however, that the reference also discloses that the temperature is increased to cause thermal cracking (col. 6, lines 12-17). Kosters also teaches that the second (reactor) temperature is 700°-1000°.

Additionally, The Examiner states that "the reference's disclosure of the production of lighter molecules is considered to encompass applicant's breaking of substantially all the molecules into two parts...) The limitation actually recited in the claim is to shear the molecules of the load "to produce hydrocarbons comprising liquid hydrocarbons, substantially no gaseous hydrocarbons, and substantially no coke or soot. In fact, Koppers discloses that its method produces substantial quantities of gas (see page 7, table), contrary to the recited limitation. The teachings of the references and the present invention are therefore clearly at odds each other.

For at least the foregoing reasons, the references cited by the Examiner fail to teach or suggest all of the limitations of the inventions claimed in claims 1, 21-23 and 26-31. More specifically, the references fail to teach or in any way suggest the conversion of a hydrocarbon load containing heavy distillates or residues, the mechanical shearing of the molecules of the

load, the type of hydrocarbon load, the preheating of the load and/or the reactor, the generation of substantially no soot or coke, and so on.

In regard to claims 32-42, the Applicant respectfully points out that these claims are not believed to be independent and distinct with respect to claims 1 and 21-31. Further, as noted above, the Examiner has not provided any reasoning for the restriction of these claims. The Applicant therefore believes that these claims are allowable for the same reasons set forth above in regard to claims 1 and 21-31 and requests reconsideration of the restriction and allowance of the claims.

CONCLUSION

For at least the foregoing reasons, the Applicant submits that the Examiner's rejections and objections to the pending claims have been overcome and that the claims are allowable. The Applicant therefore respectfully requests that the Examiner reconsider the rejections and objections and allow the claims. If any extensions of time are necessary to prevent the above referenced application from becoming abandoned, the Applicant hereby petitions for such extensions. If any fees are inadvertently omitted, or if any additional fees are required, or if any amounts have been overpaid, please appropriately charge or credit those fees to Deposit Account No. 50-0456 of Gray Cary Ware & Freidenrich, LLP.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE PURSUANT TO 37 CFR 1.111

APPENDIX 1

CLAIMS:

1. **(twice amended)** A process for the conversion of hydrocarbons containing residues or heavy distillates which may be laden with impurities into lighter liquid products that may be distilled, the process comprising:

preheating a hydrocarbon load to a first temperature, wherein the load comprises one or more hydrocarbons selected from the group consisting of residues and heavy distillates;

injecting the load into a reactor, wherein the reactor is operated at a second temperature, wherein the second temperature is less than about 520° C and about 20° C-25° C greater than the first temperature;

mechanically shearing the molecules of the load with a jet to produce hydrocarbons comprising liquid hydrocarbons, substantially no gaseous hydrocarbons, and substantially no coke or soot

21. A process for the conversion of hydrocarbons containing residues or heavy distillates which may be laden with impurities into lighter liquid products that are substantially free of soot, coke and gases, the process comprising:

preheating a hydrocarbon load;

injecting the load into a reactor, wherein the reactor is operated at a second temperature which is less than a cracking temperature of the load;

passing the load through a high-speed jet, wherein the speed of the jet is sufficient to impart enough mechanical energy to the molecules of the load to cause the molecules to split, wherein substantially all of the split molecules comprise liquid hydrocarbons.

22. A process for the conversion of hydrocarbon residues or heavy distillates into liquid hydrocarbon products with substantially no production of gasses, coke or soot, the process comprising:

preheating a hydrocarbon load to a first temperature, wherein the load comprises one or more hydrocarbons selected from the group consisting of residues and heavy distillates, and wherein the first temperature is below a temperature sufficient for thermal conversion of the load;

introducing the load into the path of a high-speed jet to cause mechanical shearing of the molecules of the load.

23. The process of claim 22, further comprising saturating the sheared molecules of the load in a soaking chamber.

24. The process of claim 23, wherein saturating the sheared molecules of the load comprises utilizing steam for the jet, wherein the sheared molecules of the load are allowed to soak in the steam.

25. The process of claim 22, wherein the jet comprises steam.

26. The process of claim 22, wherein the jet has a velocity of about 700 m/s.

27. The process of claim 22, wherein the jet is preheated to a temperature at which no substantial thermal conversion of the load occurs.

28. The process of claim 22, wherein the load is not vaporized prior to introduction into the path of the jet.

29. The process of claim 22, wherein the load is introduced into the path of the jet in a reactor, wherein the reactor is maintained at a temperature at which no substantial thermal conversion of the load occurs.

30. **(amended)** The process of claim 29, wherein the temperature of the reactor is about 540° **[degrees]** C.

31. **(amended)** The process of claim 29, wherein the temperature of the jet is about 25° **[degrees]** C greater than the temperature of the reactor.

32. A reactor for the conversion of a hydrocarbon load comprising residues and heavy distillates with substantially no production of gasses, soot or coke, the reactor comprising:

a reactor body configured to maintain a first temperature;

one or more inlets through which a load is introduced into the reactor body, wherein the load comprises at least one of the group consisting of residues and heavy distillates, and wherein the load is preheated to a second temperature; and

a nozzle through which a jet of gas is introduced into the reactor body;

wherein the first and second temperatures are all less than a temperature sufficient for thermal conversion of the load to occur; and

wherein the nozzle and the one or more inlets are positioned to introduce the load into the path of the jet.

33. The reactor of claim 32, wherein the one or more inlets comprise at least two inlets and wherein the inlets are positioned so that the path of the load introduced through each of the inlets converges with the paths of the load introduced through the other inlets.

34. The reactor of claim 33, wherein the paths of the load introduced through the inlets converge at a location which is in the path of the jet.

35. The reactor of claim 33, wherein the one or more inlets are angularly displaced from the path of the jet, and wherein, for each inlet, the corresponding path of the load crosses the path of the jet.

36. The reactor of claim 32, wherein the nozzle is configured to introduce the jet of gas into the reactor at a velocity of at least 700 m/s.

37. The reactor of claim 32, wherein the jet of gas is preheated to a third temperature which is less than the temperature sufficient for thermal conversion of the load to occur.

38. A system for the conversion of a hydrocarbon load comprising residues and heavy distillates with substantially no production of gasses, soot or coke, the system comprising:

a first heater configured to preheat a load to a first temperature, wherein the load comprises at least one hydrocarbon selected from the group consisting of residues and heavy distillates;

a reactor configured to maintain a second temperature, wherein the reactor has a nozzle for injecting a high speed jet into the reactor, wherein the reactor also has an inlet configured to inject the preheated load into the path of the jet in the reactor; and

a second heater configured to preheat a gas to a third temperature, wherein the gas is injected into the reactor through the nozzle to produce the jet;

wherein the first, second and third temperatures are less than a temperature sufficient to cause thermal conversion of the load.

39. The system of claim 38, further comprising a soaking chamber configured to allow sheared molecules of the load to mix with the gas and become saturated.

40. The system of claim 38, wherein the system is configured to utilize steam as the gas.

41. **(amended)** The system of claim 38, wherein the second temperature is about 540° **[degrees]** C.

42. **(amended)** The system of claim 38, wherein the third temperature is about 25° **[degrees]** C greater than the second temperature.